भारतीय मानक
Indian Standard

IS 17234 : 2019

यात्रियों के परिवहन के लिये रोपवे के सभी प्रकार के संचालन और अनुरक्षण — रीति संहिता

Operation and Maintenance of All Types of Ropeways Intended for Transportation of Passengers — Code of Practice

ICS 93.110

© BIS 2019

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

July 2019 **Price Group 7**

Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee, MED 06

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee, had been approved by the Mechanical Engineering Divisional Council.

An aerial ropeway is a special form of transportation system where passengers/materials are carried on a tensioned wire rope supported above the ground. In ropeways handling passengers, safety, reliability, and conformance to high-quality good industry practices are paramount for securing the safety of the users. Aerial ropeways are particularly useful in regions where the facility in surmounting natural barriers gives them a great advantage over railways or roads, both of which may need the heavy civil engineering work to secure easy gradient. They are inexpensive to maintain, pollution free, environment friendly, does not affect aesthetics, their power demand is modest, and, they are not seriously affected by adverse climatic conditions.

Nothing in this standard is intended to contravene any provisions of the statutory regulations wherever they are in force.

Composition of the Panel-1 on ‘Aerial Ropeways’ of MED 06 responsible for the formulation of this standard is given at Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*) . The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

OPERATION AND MAINTENANCE OF ALL TYPES OF ROPEWAYS INTENDED FOR TRANSPORTATION OF PASSENGERS — CODE OF PRACTICE

1 SCOPE

This standard covers the standard operating procedure (SOP), safety requirements and maintenance of all types of ropeways intended for transportation of passengers.

2 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

2.1 Ropeway —The system of overhead ropes on which carriers are used for the purpose of carriage of passengers, animals or goods and includes trestles, ropes, carrier, stations, offices, machinery and other works used for the purpose of or in connection with such aerial ropeway.

2.2 Inspecting Authority — Any competent authority recognized by the statutory regulations to inspect the aerial ropeways installation and determine its acceptability or otherwise, on the basis of this standard and compliance to prevailing statutory rules and regulations. If required, Competent Authority may hire external agencies like engineering institutions/ independent experts for carrying out said inspection.

2.3 Equipment/Component — Assembly or sub-assembly of unit, parts, devices including safety devices, drive and tension system that have been incorporated in the ropeway installation.

2.4 Operation — Running of the system for the purpose of transportation of passengers or tests.

2.5 Operator — Agency deployed for operation and maintenance of the ropeway.

2.6 Servicing — Actions intended to maintain specified condition of the system and its parts/ equipment.

2.7 Standard Operating Procedure — Procedure established by the operator or any competent authority to be followed by operating personnel to ensure safe and trouble free operation of the installation.

2.8 Inspection — Action intended for assessing the actual condition of the installation or its parts / components as also conformance with the specified performance.

3 REFUSAL OF RIDES

3.1 Rides May be Refused to persons who behave in a way that could endanger his own safety or safety of other passengers or the equipment.

4 STANDARD OPERATING PROCEDURE (SOP)

4.1 Safety

In addition to general safety rules as described in relevant Indian Standards, the following safety measures shall be taken:

a) Deployment of trained operating personnel;
b) Availability of simple and clear operating instruction (manual);
c) Ensure wearing of proper personal protective (PPE), such as helmet, safety shoes, gloves, identification badge etc.;
d) Ensure availability of medical facility (first aid, oxygen cylinder at altitude above 12 000 feet), signage, safety instructions, information or means of communication at various points of use;
e) Prevent entry and movement of passengers to the areas not designated for public use; and
f) Ensure availability of safety measures as defined in the ropeway standards.

4.2 Operating Conditions

4.2.1 Passenger transportation service shall take place only when the ropeway in-charge or the person designated by him is present at the installation.

4.2.2 Before starting daily operation, a check must be made on the condition of the ropeway as per preset daily check list including a test run encompassing the following and a record for the same must be kept:

a) the required minimum clearances from stationary structures are obeyed;

b) the position of the hauling rope and the rotation of the sheaves/rollers on the trestles are normal and there are no unusual noises/vibrations;

c) opening and Closing of the Grips are effective; and

d) all safety units are active and/or in operating conditions.

4.2.3 The ropeway operation for passenger service shall be started only with the agreement of the upper and lower station operators and receipt of 'All clear' message.

4.2.4 Whenever a cross-wind makes the cabins sway intolerably, the system operation should be temporarily stopped. Similar action should be taken upon the arrival of a storm, or whenever there is fear for the safety of the installation.

4.2.5 No operation shall be carried out in complete darkness. If it is required, the stations and the trestles must be adequately illuminated.

4.2.6 If the system operation is interrupted by safety devices or technical problems, the cause must be eliminated and a check must then be carried out to ensure that functioning is normal.

4.2.7 If a fault cannot be eliminated within a time acceptable to passengers who find themselves on the route and if it is not possible to set the ropeway installation in motion, passenger rescue must be proceeded with.

4.2.8 Rescue operation should be carried out by trained personnel only and with utmost safety.

4.2.9 Goods may be transported in separate goods cabin only if:

a) the weight does not exceed 10 percent of the equivalent passenger load;

b) the space taken by the load is compatible with the clearances;

c) the load is adequately secured against undue movement; and

d) the passengers are not unduly inconvenienced by the stops needed for loading and unloading.

4.2.10 Before leaving a station, the operating personnel must close the entrances and exits, as well as attach appropriate 'NO ENTRY' sign.

4.3 Passenger Information

Information board containing directives/regulations, Dos and don'ts, tariff plan, opening and closing time etc. shall be provided in a clear and simple, mono or bilingual text, clearly readable and displayed in a conspicuous location that passengers can notice before entering into the plant building. Entry and exit as also forbidden areas shall be marked prominently by appropriate notice /signage.

4.4 Duty and Responsibility of Operating Personnel

4.4.1 *Ropeway In-charge*

During operation, the in-charge or his designated person shall be present at the installation and shall be responsible for:

a) Total administration of the installation, both technical and commercial;

b) Operational safety including that of operators and service personnel;

c) Deployment of operating personnel at respective area and for assigned duty;

d) Ensure implementation of set instructions and procedure for operation and maintenance including any supplementary instruction;

e) Training of operating personnel on continual basis;

f) Plan requirement of spares and ensure their availability as per plan;

g) Oversee that operational records are properly maintained;

h) Decide on what measures to take in the case of a breakdown or prolonged stoppage of the installation;

j) Ensure fixing of proper signage, instruction boards, display etc. for the passengers and their maintenance;

k) Ensure that the installation as a whole and the equipment in particular do not become a source of any kind of pollution beyond the limit permissible by local regulations;

m) Decide and prominently display a time table on availability of service opening and

closing time and closing days;

n) Ensure enforcement of prevailing statutory laws, rules and regulations including labour laws;

p) Maintaining close liaison with competent authority in the event of any accident, law and order problem, labour unrest, natural calamity etc.;

q) Maintenance, updation and Safe custody of following documents (as applicable):

1) Installation permit/agreement;

2) land lease/acquisition document ;

3) clearance document from all statutory authority;

4) acceptance/fitness certificate ;

5) all test and calibration reports;

6) operation log and event logincluding accident, if any;

7) parts drawing/documents;

8) operationand maintenance manual and instructions;
9) maintenance schedule and records
10) staff record including competence assessment and improvement,
11) contact details of nearby doctors, ambulance service, hospitals,
12) Medical care unit, police, fire station, local administration; and
13) any other related and important documents.

4.4.2 Operating Personnel

Operating personal shall carry out the tasks entrusted to them by the ropeway in-charge and shall follow his instructions as under:

a) Safe operation;
b) Carrying out the operating checks specified in **5.2.3** and **5.2.4**;
c) Maintain and update operational log book;
d) Regulate the admission and transportation of the passengers and loads in accordance with **3**and **4**;
e) Help passengers, whenever needed, board and alight from cabins quickly and safely; and
f) Inform the ropeway in-charge as soon as possible if any abnormalities (smoke, sound, vibration etc.) is noticed and await instructions. However, in an emergency, they shall take appropriate measures or stop the system.

4.5 Normal Operation

After the checks stipulated in **4.2.2** are satisfactorily done, passenger transportation shall be started and continued as per scheduled hours of operation provided the operators are stationed at their assigned position and in a state of performing their respective duty as defined in **5.4.1** and **5.4.2**, weather and visibility conditions are good and wind velocity within design limit. During operation, the operating personnel shall keep a continuous careful watch on the correct functioning of the equipment. At the end of operation for the day, they will ensure that there are no passenger on line or at stations and entry is closed.

4.6 Abnormal Operation

The following may be considered as abnormal conditions:

a) Heavy rain or snow fall;
b) High wind or storm that are impending;
c) Poor visibility;
d) Failure of power supply;
e) Excessive wear in wearable parts that crossed acceptable limit; and
f) Malfunction of some safety and monitoring devices.

Ropeway operation may be continued in the above condition provided they do not pose any risk to passengers or installation. Otherwise services shall be stopped and passengers on line evacuated. Operation with alternate monitoring devices or manual monitoring permitted.

4.7 Unscheduled Stoppage

If the Ropeway is stopped unscheduled through manual or automatic energy station or if there is a disruption of service, the reasons shall be investigated by the operators and remedied wherever required. If it is felt that such remedial measures shall take a long time, passengers shall be informed and requested to keep calm. For suspected prolonged stoppage, passengers on line shall be evacuated and operation suspended.

4.8 Checks During Operation

Ropeway in–charge or any competent operator shall conduct, time to time during operation, a careful inspection of the entire installation whether the operating condition stipulated in **5.2** or other stipulations contained in this code are met and maintained or any abnormalities occurring. If any violation is noticed, the operation shall be suspended and the fault remedied before resumption of operation.

4.9 Accident

If an accident happens resulting in injury to passengers, they shall be provided medical attention as fast as possible, either on site or at the nearest medical care center.

4.10 Fire Prevention

Each station shall have minimum measures (dry powder type fire extinguishers, sand basket etc.) as per statutory rulesprevailing in that area for combating any incidence of fire. The operators shall be trained to use them. The units shall be replaced immediately upon use or expiry of useable date.

5 MAINTENANCE

5.1 General

The following minimum requirements shall generally apply in conformity with the standards listed in Annex A. A Preventive Maintenance Schedule (PMS) shall be drawn up and kept up to date. It shall take into account the required periodic inspections and maintenance operations set out in **5.2** and **5.3**. A suggestive PMS is provided in Annex B.

a) A clear and transparent format for maintaining records including break-down maintenance shall be prepared and made available to the maintenance personnel for keeping records. Suggestive formats are given in Annex C and Annex D respectively.

b) The periodic inspections and maintenance operations shall be accordance with the PMSand Formatwhich contain the reference values and Permissible tolerances, as well as the frequency of replacement for the components.

c) The specifications and defect acceptance criteria for visual inspections and non-destructive testing shall be indicated in the PMS.

d) The report on each maintenance operation shall be confirmed by the signature of the person carrying out the work.

e) Maintenance work carried out on safety components in accordance with schedule mentioned in the maintenance planshall be inspected by a second person authorized by the Ropeway In-charge and the inspection confirmed by that person's signature.

f) Necessary tools in good working condition shall be available at the installation. Also the weights required for loading the carriers when carrying out braking tests shall be kept ready in a conspicuous place.

g) The required spare parts, in a good useable condition, shall be properly stored so as to avoid damage / deformation/deterioration in a prominent and designated place in the vicinity of the installation and shall be readily available. For requirement of capital spares like motor, gear box, ropes, control drive, drive and return sheaves, main drive shaft, saddles, brake units etc, O and M manual shall be referred.

h) Lifting equipment, ropes etc., shall be kept in good condition and their permissible load shall be indicated.

j) The equipment necessary for line maintenance and the protection of workers shall be provided.

k) The special operations to be carried out on the ropes at regular intervals (for example, the renewal of sockets and the displacement of track ropes or grips), are to be carried out in accordance with applicable standards.

5.2 Inspection

5.2.1 *General*

a) Inspection shall encompass physical measurement, examination and assessment of the actual condition of the installation;

b) Inspections shall be carried out periodically at daily, weekly, monthly, yearly intervals as per maintenance plan set in **5.1**;

c) The results of the inspections shall be recorded in writing in a set format as suggested in Annex B and Annex C;

d) If deviations from the specified condition are found, necessary corrective measures shall be taken immediately and repeat inspection shall be carried out. The installation as a whole and its parts/equipment shall be continuously monitored to ensure safe operation and long life;

e) Immediately after occurrence of any accident, heavy storm or rain, snowfall and earthquake, the installation shall be inspected thoroughly; and

f) All measuring/inspection instruments shall be kept calibrated all the time and certificates shall be maintained.

5.2.2 *Daily Inspections*

Daily inspection of the items shall be carried out as per set plan and findings as also action taken shall be recorded in a format. A suggestive format is given in Annex C.

5.2.3 *Weekly Inspection*

Weekly inspection of the items shall be carried out as per set plan and findings as also action taken shall be recorded in a format. A suggestive format is given in AnnexD.

5.2.4 The monthly inspections shall include the following:

a) Performance of coupling/un coupling devices and conformance of relative position of Track rail, rope, hold down, side track etc. to the design values;

b) Performance of the drive unit, main and auxiliary including operation of over speed preventer/ monitor;

c) the external condition, position and fastening of the rollers, sheaves and tension devices;

d) Smooth movement of cabins and tow-hangers at entry, exit, inside the station and in the parking;

e) Performance of the brakes and condition of brake linings/pads. Measurement of stopping distances with empty cabin or tow-hangers and compare with preset value;

f) the manual operation of onboard brakes, with the installation stationary and the consequential operation of the corresponding switches;

g) the external condition of the carriers, door fastenings and locks, opening and closing devices, safety bars and tow-hangers;

h) the electrical safety devices; and

j) Condition of the trestle mounts, line sheaves, track rope saddles, rope catcher and guard, cabin guides, limit switches

5.2.5 *Inspection in the Case of Intermittent Operation*

If operation is intermittent, periodic inspections need not be carried out during the period of stoppage, in accordance with the following principles:

a) if operation is interrupted for a period of more than seven days, resumption of operation shall be preceded by a weekly inspection in accordance with **5.2.3**;

b) if operation is interrupted for a period of more than 1 month, resumption of operation shall be preceded by a monthly inspection in accordance with **5.2.4**; and

c) if operation is interrupted for a period of more than 6 months, resumption of operation shall be preceded by an annual inspection in accordance with **5.2.7**.

5.2.6 *Annual Inspections*

5.2.6.1 *General condition of the installation by visual examination*

a) Damage /deterioration of any structures due to the effects of accident and/or abnormal operation, frost, falling stones, snow creep, foundation settlement or similar actions;

b) Inspection of foundations for any crack, damage, tilting including the state of anchor bolts; and

c) Inspection of ground anchors.

5.2.6.2 *Ropes*

a) Electromagnetic test of the ropes in accordance with MRT standard **(***under print*); and

b) Visual check of the rope end fixings, and visual check of the signaling cables, their supports, connections and fastenings.

6 CARRIERS AND TOW-HANGERS

6.1 Visual check of each carrier or tow-hanger, including suspension, carriage and hanger. At least 20 percent of the grips shall be subjected to visual check in the dismantled condition and recorded with an identification no. so as interval between consecutive checks of each grip does not exceed 1 year. The checks and operating tests of the grips shall be in accordance with the supplier's instructions.

6.2 All grips are to be tested once a year for resistance to slipping at the minimum required slipping force, except for grips for ski-tows.

7 MISCELLANEOUS

The following visual checks shall be carried out periodically:

a) fire protection equipment;

b) first-aid equipment; and

c) special tools.

8 NON-DESTRUCTIVE TESTS

Grips, drive, return /tension shafts, anchor pin and line pedestal shall be submitted to non-destructive tests according to a programme suggested below:

8.1 All grips annually; and

8.2 100 percent of all other item mentioned above at least once a year.

9 REPAIR

9.1 Any repair work shall be recorded in writing and filed. The person carrying out the work shall certify that he has carried it out in accordance with the applicable requirements and shall immediately inform the ropeway In-charge.

9.2 Before undertaking the repair of any damage, its origin shall be determined and the initial cause shall, whenever possible, be eliminated beforehand, when this cannot be done, appropriate compensatory measures shall be evaluated.

ANNEX A

(*Clause* 5.1)

LIST OF INDIAN STANDARDS ON AERIAL ROPEWAYS

IS No.	*Title*
5228 : 2017	Continuous movement monocable ropeways with fixed grips — Code of practice
5229 : 2017	Continuous movement monocable ropeways with automatic grip — Code of practice
7649 : 1975	Glossary of terms used in connection with aerial Ropeways and Cableways
5230 : 2017	To and fro (Jig back) movement bi-cable ropeways — Code of practice
16620 : 2017	Jig back movement monocable ropeways with fixed grips — Code of practice
16623 : 2017	Pulsated movement monocable ropeways with fixed grip — Code of practice

ANNEX B

(*Clause* 1)

PREVENTIVE MAINTENANCE PLAN AND SCHEDULE (PMS)

(*Suggestive*)

PRIVENTIVE MAINTENANCE SCHEDULE — DAILY		
Sl No.	*Item*	*Work to be Done*
1)	Cabin, hanger andgrip	Visual check against any damage, breakage, missing or loosen bolts/ nuts, lock pin, cleanliness.
2)	Abnormal sound or vibration	Search to find cause.
3)	Operation of brakes	Visual check against any abnormalities or heating of thrustor, Power pack components.
4)	Drive, return sheave bearings, motor bearings	Feel by hand. If felt over-heated, check with thermoster.
5)	Diesel engine	Visual check for oil level, radiator water level, battery water level and terminal condition.
6)	Diesel generator	Visual check for oil level, radiator water level, battery water level and terminal condition. Output power voltage
7)	Safety switches at stations and line	Check tightness of bolts as also desired performance.

PRIVENTIVE MAINTENANCE SCHEDULE — WEEKLY		
Sl No.	*Item*	*Work to be Done*
1)	Drive sheave liner	Check wear and tear at both stations
2)	Return sheave liner	
3)	Service brake liner	
4)	Emergency brake liner	
5)	Coupling bolts, bush, chain link	Check condition/ tightness in static condition
6)	Main motor fixing bolts	
7)	Rescue motor fixing bolts	
8)	Cardon shaft fittings	
9)	Drive/return sheave all joint bolts	
10)	Gear ring and drive sheave connecting bolts	
11)	Main gear box fixing bolts	
12)	Rescue engine fixing bolts	
13)	Drive bed foundation / fixing bolts	
14)	Tensioning hydraulic pack assembly	
15)	Station all limit switch fixing bolts	
16)	Rope in position on drive andreturn sheave	Adjust if required.
17)	Locking / unlocking module	Check relation between rope, rail, side roller track etc. and adjust to the limit as specified in manual.
18)	Operation of grip testing device	Check tightness of bolts
19)	Greasing at tension trolley track	Apply grease, if dry.
20)	Tyre pressure for cabin hauler	Check with the limit specified in the Manual and refill, if necessary.
21)	Station structural/monorail fixing bolts	Check condition/ tightness in static condition
22)	Guide for cabin movement at station	Check for proper functioning
23)	Tower foundation and joint bolts	Check condition/tightness in static condition
24)	Ladder and structural bolts	
25)	Line sheave alignment with respect to rope	Adjust, if required.
26)	Lightning arrester fixing	Check condition at line
27)	Anemometer fittings	
28)	PA system	
29)	Condition of earth pits / pouring of water	Visually / Water pouring

Sl No.	*Item*	*Work to be Done*
30)	Firefighting system	Check condition
31)	CCTV auto backup working	
32)	All PA speaker at station and line	
33)	Main Rope including splice zone	Feel by hand throughout the length wearing safety gloves against any wire breakages, kink etc.
34)	Line signal cable and catenary rope	Check condition and sag

PRIVENTIVE MAINTENANCE SCHEDULE — MONTHLY		
Sl No.	*Item*	*Work to be Done*
1)	H. rope lubrication of splice knots	Lubrication
2)	Check main motor electric connections	Tightness by spanner
3)	Check earth resistance at main motor	Megger >15 Ohm
4)	Emergency brake - gap between pad and bull wheel / disc	Set as per manufacturer's recommendation
5)	Emergency brake, brake linear thickness	Replace as per manufacturer's recommendation
6)	Service brake - gap between linear and disc	Set as per manufacturer's recommendation
7)	Service brake linear thickness	Replace as per manufacturer's recommendation
8)	Emergency braking testing	Braking test with empty cabins, check recorded deceleration curve.
9)	Service braking testing	
10)	Emergency engine drive test run	Whole cableway
11)	Emergency electric drive test run	Whole cableway
12)	Line sheave and its pedestal / bracket	Greasing
13)	Line sheave assembly connecting bolts of side plates	Tighten, if required preferably using torque wrench
13)	Line sheave linear of rope grove	Check wear whether exceeded permissible limit as specified in the manual. Replace, if required
14)	Check joint bolts of tower to tower head	Tightness by spanner
15)	Drive/PLC panel all internal connections	Check continuity as per circuit
16)	Components condition in drive/PLC panel	Visual
17)	cleanliness of drive panel	Visual
18)	Earth resistance at drive panel terminal	Megger, >5 Ohm
19)	Component Em. Motor drive panel	visual / condition
20)	Insulation/Earth resistance of all electrical components — between phases and phase to earth	Check using megger

PERIODICAL MAINTENANCE SCHEDULE — HALF YEARLY		
Sl No.	*Item*	*Work to be Done*
1)	Hauling rope clean	Manually
2)	Main gear box oil	Oil consistency (WDA)
3)	Main motor cooling fan electrical connection	Proper tightness
4)	Emergency Engine drive and gear box oil level	Check visually
5)	Emergency Motor drive gearbox oil level	Check visually
6)	Tension carriage check bolted connection	Tightness by spanner
7)	Tension carriage wheel bearing	Greasing of bearing eye
8)	Check Rope clamp force	Use hydraulic tools
9)	Cabin doors rubber profiles	Visually
10)	Hanger arms check bolted connection	Tightness by spanner
11)	Check joint bolts of tower head to platform	Tightness by spanner
12)	Measurement of tuck points in, Splice zone	Manual by tape

NOTE — The above list is suggestive. However, engineer in-charge may modify the same as per the requirement of exact type of ropeway system being maintained.

ANNEX C

FORMAT FOR DAILY MAINTENANCE RECORD

(*Suggestive*)

DAILY CHECK REPORT							**Passenger ropeway**								
Date:		Day													**Sr. No.:**
Activity & Location	**Instrument /Tools**	**Item/Equipment & Observation**				**Attended By**	**Activity & Location**	**Instrument/Tools**	**Item/Equipment & Observation**						**Attended By**
Check all Cabin, Hanger and Grip assembly	Visually / by working	Cabin Door Lock Working					Check tensioning system at Drive Station	Trolley position (Inch) / Pressure Bar/ Visually	From back stopper	No load		Full load			
		Cabin cleaning and all parts fitting							From front stopper	No load		Full load			
		Cabin and H-bracket fitting							Pressure gauge	No load		Full load			
		H-bracket and fitting							Tension Cylinder & Hydraulic pack motor working						
		Cabin Grip assembly condition					**ELECTRICAL CHECK**								
Temperature in running condition							Main supply (V)	Visual / Existing Meter / Indications	**R-Y**		**Y-B**		**B-R**		
Ambient temp	Non-Contact Thermometer (In °C)	L/Stn		U/Sn			Main motor current		**Startin g**		**No load**		**Full load**		
Main motor		Drive End		Body			Panel healthiness		**SSB-1**		**SSB-2**		**SSB-3**		
Cardan shaft		Motor side		GB side			Ropeway speed		Run speed(m/s)			Crawling Speed(m/s)			
Main gear box		Input		Output			**MOTORS**		**Main**	**Blower**	**Rescue**	**Oil cooler**	**Hyd. Tn.**	**Brake**	
		Body		Oil			All fixing bolt	Visual/ Paint mark							
MGB cooler motor		Body		Pump			Earth connection								
Drive sheave bearing		Top		Bottom			Cleanliness								
Rtn. sheave bearing		Top		Bottom			Fixing & Connection		Bull wheel Encoder			Rope Encoder			
Hydraulic Tn. Motor		Body					**CABIN RUNNING IN LINE**								
Safety brake motor		Body					**W1**	**W2**	**W3**	**W4**	**B1**	**B2**	**B3**	**B4**	
Service brake motor		Body					**Y1**	**Y2**	**Y3**	**Y4**	**G1**	**G2**	**G3**	**G4**	

MAIN GEAR BOX					
Check in running condition	By hearing	Noise/vibration			
	Visually	Temp. sensor fittings and working			
	Visually	Oil leakage			
	Visually	Fdn./fixing bolts paint mark			
LINE					
Wind speed (Km/Hr.)	Maximum	Tower-6		Tower-7	
Line sheave liner	Visually	Noise and liner condition			
LPS andsignal cable	Visually	Fixing at tower			
Cable station guide	Visually	**L/Stn**		**U/Stn**	

Rescue equipment	Visual / In position	U/Stn		Line		L/Stn		
QRT		Upper station			Lower Station			

Cumulative Ropeway running Hrs.	**For the day**			**SHEAVE LINER REPLACED IF ANY**	
	For the week			**Sheave No.**	
	For the month				
	From 1st April				

Remarks:

DETAIL OF ROPEWAY RUNNING HOURS		**TOTAL**	**Mark [√] for OK,[X] for defective, readings, initials wherever applicable in** ☐		
Power supply			**PREPARED BY**	**PI SIGN**	**UNIT HEAD SIGN**
AC Rescue drive					
Diesel engine drive			**DATE**	**TIME**	

ANNEX D

FORMAT FOR MONTHLY MAINTENANCE RECORD

(*Suggestive*)

WEEKLY CHECK REPORT **Year ………… to ……………….** **From ……….. to ……………..**			**PASSENGER ROPEWAY**				**Sl. No………**
ACTIVITY AND LOCATION	**INSTRUMENTS/ TOOLS**	**ITEM**	**ATTENDED BY**	**ACTIVITY AND LOCATION**	**INSTRUMENTS / TOOLS**	**ITEM**	**ATTENDED BY**
Check wear and tear at both Station	Visual	☐ Drive sheave liner	☐	Check tightness at stations and Line	Spanner / Visual Paint mark	For two tower ☐ ☐	
		☐ Return sheave liner	☐			☐ Sheave axel, rocker and suspension bolts	☐
		☐ Service brake liner	☐			☐ Tower foundation and joint bolts	☐
		☐ Emergency brake liner	☐			☐ Ladder and structural bolts	☐
		☐ Chain and link of chain coupling	☐			☐ Break fork mounting bolts	☐
		☐ Main motor fittings	☐	Tightness in static condition at return Stn	Spanner / Visual Paint mark	☐ Return sheave all joint bolls	☐
		☐ Rescue motor fittings and triple chain	☐			☐ Station structural bolts	☐
		☐ Cardan shaft fittings	☐	Check condition	Visual / by operating	☐ Firefighting system	☐
		☐ Drive sheave all joint bells	☐			☐ CCTV auto backup working	☐
Check condition/		☐ Gearing and drive fixing bolts	☐			☐ All PA speaker at station and line	☐

tightness in static condition at drive station	Spanner / Visual paint mark	☐ Main gear box fixing bolts	
		☐ Rescue engine fixing bolts and triple chain	
		☐ Drive bed foundation / fixing bolts	
		☐ Brake hydraulic pack assembly fittings	
		☐ Service brake Assembly Emergency brake assembly	
		☐ Tensioning hydraulic pack assembly	
		☐ Station structural / monorail fixing bolts	
Check condition at line	Visual/ Tightness	☐ Lightning arrester Fixing	
		☐ Tower communication junction box (inside)	
		☐ Anemometer fittings at Tr.6 and Tr.7	
		☐ Sound horn fittings at Tr.5, Tr.6and Tr.7	
Check at Both stations	Manual	☐ Condition of earth pits / pouring of water	
	Spanner / Visual Paint mark	☐ Top & guide for cabin movement at Slaton	
		☐ Cabin lock-unlocking guide fixing bolts	
Chick in line/both stations	Visual	☐ Rocker and Line sheave alignment with respect torope	
		☐ Rope in position on drive andreturn sheave	
		☐ Check tightness of cabin grip bolts	
		☐ Greasing at tension trolley track	
		☐ Station all limit switch fixing bolts	
Check breakage/ deformation	Visual	☐ Splice zone of haulage rope at 0.3mtr./sec.	
		☐ Line signal cabe and calenary rope	
Check dimension in static condition	Vemier	**TUCK POINTS DIMENSION (In mm)**	
		1) 2) 3)	
		4) 5) 6)	
		Many Point dimension (In mm)	
		Normal dimension (In mm)	

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Composition of the Panel-1 on 'Aerial Ropeways' MED 06

Organizations	*Representative(s)*
In Personal Capacity	SHRI A. BHADRA (***Convener***)
In Personal Capacity	SHRI C. K. KARMAKAR
In Personal Capacity, Kolkata	SHRI DWIJENDRA LAL DAS (*Invitee*)
CSIR-CIMFR, Dhanbad	DR DEBASISH BASAK
CRS, Pvt Ltd, Kolkata	SHRI K. BOSE
Damodar Ropeways & Infra Ltd, Kolkata	SHRI RANJAN MUKHERJEE
Usha Breco Limited, Ghaziabad	SHRI MANOJ PANWAR

Member Secretary

SHRI A. K. MOHINDROO
SCIENTIST 'C' (MED), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: MED 06 (13573).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices: *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002 — 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi
KOLKATA 700054 — 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg
CHANDIGARH 160019 — 265 0206, 265 0290

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 — 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093 — 2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi